CE5.h related: Reducing the coding cost of merge index by dynamic merge candidate list re-ordering

Thomas Guionnet, Laurent Guillo, Christine Guillemot

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Title: **CE5.h related: Reducing the coding cost of merge index by dynamic merge candidate list re-ordering**

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Author(s) or Contact(s):
Thomas Guionnet — Email: Thomas.Guionnet@inria.fr
Laurent Guillo — Laurent.Guillo @inria.fr
Christine Guillemot — Christine.Guillemot@inria.fr

Source: INRIA, France

Abstract

HEVC implements a candidate vector list for merge and skip modes. When merge or skip modes are selected, a merge index is written in the bitstream. This index is first binarized using a unary code, then CABAC encoded. A CABAC context is dedicated to the first bin of the unary coded index while the remaining bins are considered as equiprobable. This strategy is efficient as long as the candidate list is constructed such as being ordered by decreasing index occurrence probability. In the context of 3D video encoding, an inter-view motion vector predictor is added at the first position of the candidate list. It is reported in this document that the inter-view motion vector predictor is not always the most probable candidate. It actually depends on the video sequence characteristics. Therefore, a dynamic candidate vector list ordering is proposed. Coding gains of 0.1 % on average are observed on side views and up to 0.6% is attained for the GTFly sequence view 2.

1 Introduction

HEVC relies on a candidate vector list for merge and skip modes. The efficiency of this approach depends on two parts: first the relevance of the vectors present in the list and second the encoding efficiency of the selected merge index. The candidate vector list is designed such that the vectors are ordered by decreasing likelihood of selection. This property is then exploited for merge index coding. The merge index is binarized using a unary code, then CABAC encoded. Except for the first bin, the bins are considered as equiprobable when fed to the CABAC. Therefore, the main factor ensuring efficient merge index coding is the unary code associated to the decreasing likelihood ordering of the vectors.

In the context of 3D video coding, an inter-view motion vector predictor is added into the candidate list. This vector is especially relevant and thus selected very often. Therefore, it is always placed at first position in the candidate list. By doing simple statistics, it has been observed that although this vector is the most likely to be selected on average, its relevance depends on pictures or even sequences characteristics. Therefore, a dynamic list reordering process is proposed in order to improve the efficiency of inter-view motion vector prediction.

2 Proposed method

The proposed process is performed symmetrically in the encoder and decoder. It is described on the decoder side.

A Merge index histogram is computed on the fly. In order to avoid constraining dependencies and robustness loss, the process is reinitialized at the same points as the entropy coder (for instance at the beginning of each slice). The histogram is not initialized with 0 values, but with arbitrary exponentially

decreasing values as shown in Table 1. It brings stability when the process begins by avoiding taking index swapping decision without statistically significant data accumulation. Given a current histogram, a conversion table can be simply calculated. It allows deriving the merge index to encode given the actual index in the list, and conversely the actual index in the list given a decoded index.

Table 1: Initialization values of the merge index histogram

32	16	8	4	2	1

Each time a Merge index is decoded from the bitstream, it is converted to its actual position in the list and the histogram is updated accordingly. The conversion table is updated only at the end of each LCU.

3 Experimental results

The experiment has been conducted with HTM 3.0 and evaluation is based on common test conditions [1].

Results are provided in Table 2.

Table 2: Results obtained with HTM 3.0 and Merge list reordering, compared to HTM 3.0.

	video 0	video 1	video 2	video only	synthesized only	coded & synthesized	enc time	dec time
Balloons	0,0%	0,0%	0,0%	0,0%	0,1%	0,0%	99,5%	100,8%
Kendo	0,0%	0,0%	-0,1%	0,0%	-0,1%	0,0%	101,0%	101,2%
Newspapercc	0,0%	0,1%	-0,1%	0,0%	0,3%	0,2%	103,1%	100,0%
GhostTownFly	0,0%	-0,5%	-0,6%	-0,1%	-0,1%	-0,1%	107,7%	100,6%
PoznanHall2	0,0%	0,1%	0,1%	0,0%	0,0%	0,0%	107,2%	99,0%
PoznanStreet	0,0%	0,0%	0,1%	0,0%	0,0%	0,0%	108,1%	100,5%
UndoDancer	0,0%	-0,3%	-0,2%	-0,1%	0,0%	0,0%	106,3%	101,6%
1024x768	0,0%	0,0%	0,0%	0,0%	0,1%	0,1%	101,2%	100,7%
1920x1088	0,0%	-0,2%	-0,1%	0,0%	0,0%	0,0%	107,3%	100,4%
average	**0,0%**	**-0,1%**	**-0,1%**	**0,0%**	**0,0%**	**0,0%**	**104,7%**	**100,5%**

4 Conclusion

A merge index coding improvement is proposed. The likelihood of merge index values is evaluated by filling dynamically a histogram. The shortest codeword can then be assigned to the most likely merge index. The reported coding gains are low on average (0.1 % on side views) but can be high (up to 0.6%) depending on the sequence characteristics. Improvement is expected by refining the histogram initialization procedure. The complexity of the proposed method is negligible.

As this method achieves relevant gains with no added complexity, we propose to include it in a core experiment for further study.

5 References

[1] Heiko Schwarz, Dmytro Rusanovskyy, « Common test conditions for 3DV experimentation », ISO/IEC JTC1/SC29/WG11 MPEG2011/N12745, May 2012, Geneva, Switzerland.

6 Patent rights declaration(s)

INRIA does not have any current or pending patent rights relating to the technology described in this contribution.